

## CLAIMS

What is claimed is:

1. A compound comprising hematin derivatized with one or more non-proteinaceous amphipathic groups.
- 5 2. The compound of Claim 1, wherein said compound is soluble in solutions ranging from pH 1 to pH 12.
3. The compound of Claim 1, wherein the amphipathic group is a substituted or unsubstituted polyalkylene glycol.
4. The compound of Claim 3, wherein the polyalkylene glycol is substituted or 10 unsubstituted polyethylene glycol.
5. The compound of Claim 4, wherein polyethylene glycol groups have a molecular weight of about 400 to about 100,000.
6. A method of polymerizing an aromatic monomer, comprising combining an aromatic monomer with a hematin catalyst, wherein the hematin catalyst has 15 been derivatized with one or more non-proteinaceous amphipathic groups.
7. The method of Claim 6, further comprising combining a peroxide initiator with the aromatic monomer and the derivatized hematin.
8. The method of Claim 7, further comprising a template, wherein the aromatic monomer aligns along said template and polymerizes to form a complex 20 comprising the polymerized aromatic monomer and the template.

9. The method of Claim 8, wherein the template is a polyelectrolyte.
10. The method of Claim 9, wherein the polyelectrolyte is polyanionic.
11. The method of Claim 10, wherein the polyanionic polyelectrolyte is poly(styrene sulfonic acid) or a salt thereof.
- 5 12. The method of Claim 8, wherein the template is optically active.
13. The method of Claim 12, wherein the optically active template is an oligonucleotide or a polynucleic acid or a salt thereof.
14. The method of Claim 13, wherein the polynucleic acid is 2'-deoxyribonucleic acid or a salt thereof.
- 10 15. The method of Claim 10, wherein the template is lignin sulfonic acid or a salt thereof.
16. The method of Claim 10, wherein the template is dodecylbenzene sulfonic acid or a salt thereof.
17. The method of Claim 8, wherein the aromatic monomer is a substituted or  
15 unsubstituted aromatic compound.
18. The method of Claim 17, wherein the aromatic compound is an aniline.
19. The method of Claim 18, wherein the aniline is 2-methoxy-5-methylaniline.

20. The method of Claim 17, wherein the aromatic compound is a phenol.
21. The method of Claim 18, wherein the complex formed is a water-soluble complex of a polyaniline and the template.
22. The method of Claim 21, wherein the polyaniline is of the electrically-conducting emeraldine salt form.
23. The method of Claim 20, wherein the complex formed is a water-soluble complex of polyphenol and the template.
24. The method of Claim 12, wherein the polymerized aromatic monomer complexed to the template has a macro-asymmetry.
- 10 25. A method of preparing a derivatized hematin, comprising reacting hematin with one or more amphipathic compounds, thereby forming a derivatized hematin.
26. The method of Claim 25, wherein the hematin is reacted with one or more amphipathic compounds in the presence of a carboxylic acid activating compound and an aprotic base.
- 15 27. The method of Claim 26, wherein the carboxylic acid activating compound is a dialkylcarbodiimide.
28. The method of Claim 25, wherein the amphipathic compound is a substituted or unsubstituted polyalkylene glycol.
29. The method of Claim 28, wherein the polyalkylene glycol is polyethylene glycol.

30. An assembled hematin comprising hematin deposited on an electrically charged substrate in one or more layers alternating with one or more layers of a polyelectrolyte.

31. The assembled hematin of Claim 30, wherein the polyelectrolyte is a cationic polymer.

32. The assembled hematin of Claim 31, wherein the cationic polymer is a poly(dialkyldiallylammonium salt) or a poly(trialkylallylammonium salt).

33. The assembled hematin of Claim 32, wherein the poly(dialkyldiallylammonium salt) is poly(dimethyldiallylammonium chloride).

10 34. A method of polymerizing an aromatic monomer, comprising contacting an aromatic monomer and a template with assembled hematin, wherein assembled hematin comprises hematin deposited on an electrically charged substrate in one or more layers alternating with one or more layers of a polyelectrolyte, thereby polymerizing the aromatic monomer to form a complex of polymerized aromatic monomer and said template.

15 35. The method of Claim 34, wherein the template is an anionic polymer.

36. The method of Claim 35, wherein the anionic polymer is polystyrene sulfonic acid or a salt thereof.

37. The method of Claim 34, wherein the aromatic monomer is a substituted or unsubstituted aromatic compound.

20 38. The method of Claim 37, wherein the aromatic compound is an aniline or a

phenol.

39. The method of Claim 34, wherein the complex of a polymerized aromatic monomer and a template forms in solution.
40. The method of Claim 34, wherein the complex of a polymerized aromatic monomer and a template forms on the assembled hematin.
- 5 41. A method of forming assembled hematin, comprisingly alternately depositing one or more layers of hematin and one or more layers of a polyelectrolyte on an electrically charged substrate.
42. The method of Claim 41, wherein the polyelectrolyte is a cationic polymer.
- 10 43. The method of Claim 42, wherein the cationic polymer is a poly(dialkyldiallylammonium salt) or a poly(trialkylallylammonium salt).
44. The method of Claim 43, wherein the poly(dialkylallylammonium salt) is a poly(dimethyldiallylammonium chloride).